Substitute Specification:

METHOD AND CIRCUIT FOR CONFIRMING SERVICEABILITY AND CORRECT USE OF CONNECTING CABLES IN A SWITCHING DEVICE

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention generally pertains to fault detection, and in particular to fault detection in connecting cables of switching devices.

Discussion of the Related Art:

In order to evaluate output signals which occur at each of the ends of tested connecting cables, a separate evaluation procedure and, a separate evaluation circuit are normally required in the switching units connected thereto. There has long been a need to reduce or avoid this complex process.

The present invention is based on indicating a way in which, the serviceability and the correct use of switching units of a switching device can be confirmed in a relatively simple manner with less effort than before, with the aid of the connecting cables which connect plug connections to one another.

The present invention is distinguished by the fact that it involves virtually no additional monitoring effort since it makes joint use of fault monitoring devices, which are normally present in any case in the switching units, for confirming the serviceability and the correct use of the connecting cables.

Faulty synchronization signals are preferably used as transmission signals having faults. This allows synchronization fault monitoring devices,

which exist in the switching units, to be jointly used for confirming the serviceability and the correct use of said connecting cables.

Corrupted synchronization signals of ATM information signals are preferably used as transmission signals having faults because ATM switching devices make use of this measure in an advantageous manner.

The method according to the present invention is carried out using a circuit arrangement in a switching device, which contains switching units connected to one another by means of plug-in connecting cables. The switching units of the switching device are equipped with fault signaling devices which emit fault reporting signals when specific faulty transmission signals occur.

The circuit according to the present invention, involves a test device connected to the switching units of the switching device, which are in turn connected to one another by means of the connecting cables. The test device emits transmission signals, corrupted by faults, as test signals to a first set of switching units of the switching device, and which checks the other switching units. The other switching units are connected to the first set of switching units via the connecting cables, for the occurrence of fault reporting signals. Therefore, no additional circuitry complexity whatsoever is required in the switching units of the switching device. Instead, all that is needed is the test device, which is required in any case.

In addition, the test device can preferably be connected via separate connecting lines to the switching units connected to one another by means of the connecting cables. Thus, the relevant test device can be used in a very particularly simple manner.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method and circuit for confirming the serviceability and correct use of switching units of a switching device

It is another object of the invention to provide a method and circuit for confirming the serviceability and correct use of switching units of a switching device with the aid of connecting cables which connect plug connections to one another by emitting test signals to one of the ends of relevant connecting cables.

It is a further object of the invention to provide a method and circuit for confirming the serviceability and correct use of switching units of a switching device by evaluating the output signals which occur at each end of the relevant connecting cables.

It is yet another object of the present invention to provide a method and circuit for confirming the serviceability and correct use of switching units, including fault monitoring devices which respond to specific faults in transmission signals, such that any signals having such faults are transmitted as test signals via the connecting cables.

These and other objects of the invention will become apparent upon careful review of the following detailed description of the presently preferred embodiments, which is to be read in conjunction with a review of the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 shows a cable connection arrangement according to the present invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

Figure 1 shows two device blocks DB1 and DB2 of a switching device, which each have a series of switching units SU11, SU21, SU31, SU12, SU22, and SU32. These switching units are connected to one another with the aid of plug connections via multicore connecting cables C1, C2 and C3. The fact that the relevant connecting cables have a number of cores is in this case indicated by a short oblique bar crossing the respective connecting cable. At the device block DB1 end, the plug connections comprise firstly plug sockets SO11, SO21 and SO31, respectively, and at the device block DB2 end, the relevant plug connections comprise plug sockets SO12, SO22 and SO32.

Connecting cables C1, C2 and C3, are inserted into these plug sockets with the aid of plugs CON11, CON21, CON31, CON12, CON32 and CON22. Here, a test circuit TC is connected via connecting lines, which each comprise a number of individual lines, to the switching units SU11, SU21 and SU31 of the device block DB1, and to the switching units SU12, SU22 and SU32 of the device block DB2. In the case of the switching units SU11, SU21 and SU31, the connecting lines are indicated by a single connecting line TL marked by a short oblique bar. In the case of the switching units SU12, SU22 and SU32, the relevant connecting lines are indicated by a single connecting line RL, likewise marked by a short oblique bar.

Test signals can be emitted via line TL from the test circuit TC to separate inputs of the switching units SU11, SU21 and SU31. Evaluation signals can be received by the switching units SU12, SU22 and SU32 from

the test circuit TC via the line RL. In the present case, these evaluation signals, as will be described below in more detail, are formed by fault reporting signals, which can be checked by separate fault signaling registers R12, R22 and R32, respectively, in said switching units SU12, SU22 and SU32.

Test circuit TC has a microprocessor MP, connected via a multicore bus line BUS to a program memory ROM, to a random access memory RAM which is used as the main memory, to a control and display unit OD, and to two interface devices IF1 and IF2, to which the lines TI and RL, are connected. Multicore bus line BUS, whose multicore nature is indicated by a short oblique bar crossing each of the individual lines, can be subdivided into an address bus line, a data bus line and a control bus line.

Now that the construction of the circuit of Figure 1 has been explained to the extent necessary for understanding of the present invention, the method of operation of this circuit arrangement will now be described.

As stated above, the aim of the invention is to confirm the serviceability and the correct use of connecting cables, with respect to connecting cables C1, C2 and C3 illustrated in Figure 1. It is assumed that the relevant connecting cables are used correctly, that is to say are connected, when they connect the plug socket pairs SO11 and SO12, SO21 and SO22, as well as SO31 and SO32 to one another. This means that only the connecting cable C1 is connected correctly in Figure 1.

In order to obtain confirmation of correct connecting switching units SU11, SU21 and SU31 are supplied with test signals from test circuit TC. Transmission signals having precise specifically faulty synchronization

signals are used as test signals. In the situation where messages in the form of ATM signals are transmitted in the switching device, these synchronization signals may be contained in the ATM signals.

The faulty transmission signals are transmitted via connecting cables C1, C2 and C3 to switching units SU12, SU22, SU32 which are part of the device block DB2. These faulty transmission signals are identified in the fault monitoring devices there, and corresponding fault reporting signals are then immediately stored in associated fault signaling registers R12, R22 and R32, respectively. By appropriate checking of these fault signaling registers R12, R22 and R32, it is thus possible to confirm in the test circuit TC whether or not the faulty transmission or synchronization signals supplied as test signals to the individual switching units SU11, SU21 and SU31 in the device block DB1, result in desired fault triggering in switching units SU12, SU22 and SU32 in the device block DB2.

For example, connecting cable C1 is the correctly connected connecting cable in the exemplary embodiment. In the case of the connecting cables C2 and C3, fault reporting signals do not occur in the respectively desired switching units SU22 and SU32 in the device block DB2, since these are two incorrectly connected connecting cables. In this example, cables C2 and C3 are incorrectly connected interchangeably. That is to say in the switching units SU32 and SU22, respectively.

This is identified in the test circuit TC, by which the incorrect use or incorrect connection of the connecting cables C2 and C3, can be identified. Thus, the occurrence of the fault reporting signals at the respectively desired point is used as a positive indication of correct use of the respective connecting cable.

The procedure explained above means that it is now not only possible to determine correct use, that is to say correct connection of the connecting cables, but, the serviceability of the respective entire connecting cable can also be confirmed. To do this, test signals are transmitted, preferably successively, via the various cores of the respective connecting cable.

Finally, it should also be mentioned that the present invention can be used not just in the one transmission direction between switching units of a switching device connected to one another by plug-in connecting cable, but can also be used, if required, in the opposite transmission direction.

Although modifications and changes may be suggested by those skilled in the art to which this invention pertains, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications that may reasonably and properly come under the scope of their contribution to the art. - -